THE INVENTION CLAIMED IS

1. A method of constructing poly-nucleotides, comprising the steps of: ligating strands of DNA using a complementary sequence as a template and a ligase.

2. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilitzes a complementary sequence as a template.

3. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a complementary sequence as a template and a ligase.

4. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a ligase.

5. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a linker.

6. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes ds-DNA.

7. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a surface with a template at said surface.

8. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a surface with a linker at said surface.

9. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes a surface with a ds-DNA at said surface.

10. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes hybridization to a complementary template which has been tethered to a ligase enzyme

11. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes ligase joining two strands of DNA.

12. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes blunt-end ligase joining two strands of DNA.

13. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes sticky-end ligase joining two strands of DNA.

14. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes ligase wherein said ligase joins two single-strands of DNA.

15. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand.

16. The method of constructing poly-nucleotides of claim 1 wherein said step of ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand as a template.

17. The method of constructing poly-nucleotides of claim 1 including repeatedly adding single-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

18. The method of constructing poly-nucleotides of claim 1 including repeatedly adding double-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

19. The method of constructing poly-nucleotides of claim 1 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA.

20. The method of constructing poly-nucleotides of claim 1 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA that are combined and assembled as directed by the output of a computer program.

21. A method of making very long, double-stranded synthetic poly-nucleotides comprising the steps of:

providing a multiplicity of oligonucleotides,

sequentially hybridizing said oligonucleotides to each other, and

enzymatic ligating said oligonucleotides to provide a contiguous piece of PCR-ready DNA of predetermined sequence.

22. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating comprises ligating two single strands of DNA using a complementary sequence as a template and a ligase.

23. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilitzes a complementary sequence as a template.

24. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilitzes a complementary sequence as a template and a ligase.

25. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes a ligase.

26. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes a linker.

27. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes ds-DNA.

28. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes a surface with a template at said surface.

29. The method of constructing poly-nucleotides of claim 21 wherein said step of ligating utilizes a surface with a linker at said surface.

30. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes a surface with a ds-DNA at said surface.

31. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes hybridization to a complementary template which has been tethered to a ligase enzyme

32. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes ligase joining two strands of DNA.

33. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes blunt-end ligase joining two strands of DNA.

34. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes sticky-end ligase joining two strands of DNA.

35. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA.

36. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand.

37. The method of constructing poly-nucleotides of claim 21 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand as a template.

38. The method of constructing poly-nucleotides of claim 21 including repeatedly adding single-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

39. The method of constructing poly-nucleotides of claim 21 including repeatedly adding double-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

40. The method of constructing poly-nucleotides of claim 21 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA.

41. The method of constructing poly-nucleotides of claim 21 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA that are combined and assembled as directed by the output of a computer program.

42. A method of making very long, double-stranded synthetic poly-nucleotides comprising the steps of:

providing a multiplicity of short single-stranded oligonucleotides,

sequentially hybridizing said short single-stranded oligonucleotides to each other, and

enzymatic ligating said short single-stranded oligonucleotides to provide a contiguous piece of PCR-ready double stranded DNA of predetermined sequence.

43. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating comprises ligating two single strands of DNA using a complementary sequence as a template and a ligase.

44. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilitzes a complementary sequence as a template.

45. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilitzes a complementary sequence as a template and a ligase.

46. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes a ligase.

47. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes a linker.

48. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes ds-DNA.

49. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes a surface with a template at said surface.

50. The method of constructing poly-nucleotides of claim 42 wherein said step of ligating utilizes a surface with a linker at said surface.

51. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes a surface with a ds-DNA at said surface.

52. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes hybridization to a complementary template which has been tethered to a ligase enzyme

53. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes ligase joining two strands of DNA.

54. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes blunt-end ligase joining two strands of DNA.

55. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes sticky-end ligase joining two strands of DNA.

56. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA.

57. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand.

58. The method of constructing poly-nucleotides of claim 42 wherein said step of enzymatic ligating utilizes ligase wherein said ligase joins two single-strands of DNA using a second complementary strand as a template.

59. The method of constructing poly-nucleotides of claim 42 including repeatedly adding single-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

60. The method of constructing poly-nucleotides of claim 42 including repeatedly adding double-stranded DNA to a growing piece of double-stranded DNA which is tethered to the ligase enzyme.

61. The method of constructing poly-nucleotides of claim 42 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA.

62. The method of constructing poly-nucleotides of claim 42 including repeatedly adding either single-stranded DNA or double-stranded DNA to a growing piece of double-stranded DNA that are combined and assembled as directed by the output of a computer program.